Informally

Formal/Notation

Slope - derivitive
differentiation

$$m = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

∞

Area - Integral
Integration

① A rock breaks loose from the tp of a tall cliff. What is the average speed during the 1st 2 seconds of fall?

$y = 16t^2$

y → dist. of fall (feet)

t → time (sec)

② What is the speed at $t = 2$ seconds

$y = 16t^2$

$y = 16(2)$

$0 \rightarrow 64_{ft} = y$

$64_{ft}/2_{sec}$ 32 ft/sec

$0 \rightarrow 2$ sec.

$y = 16(0)^2$ $y = 16(1)^2$ $y = 16(2)^2$

$y = 0$ ft + $y = 16$ ft/1 sec + $y = 64$ ft/2 sec

$\frac{16 + 32}{3}$

48/3 = 16 ft/sec

10 10 10

$= 60/3 = 20$

1st = 16

2nd = 48 > 64 total / 2

Change

Avg speed $\frac{\Delta y}{\Delta t}$ $\begin{matrix}-\text{dist}\\ -\text{time}\end{matrix}$

$x = \frac{1}{2}at^2$

$a = 32\ ft/s^2$

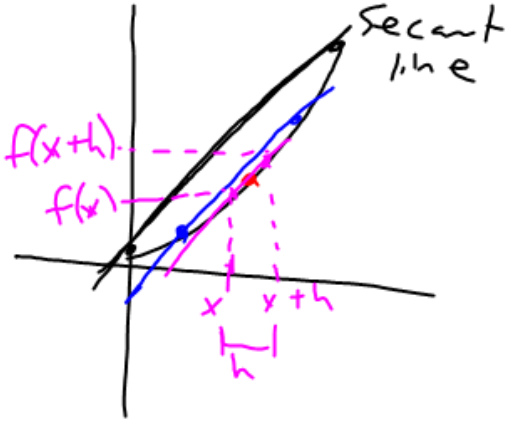
$at = v$

$32 \cdot 2 = 64\ ft/s$

} from physics

Difference Quotient

$$m = \frac{y_2 - y_1}{x_2 - x_1} \Rightarrow \frac{f(x+h) - f(x)}{x+h-x} = \boxed{\frac{f(x+h) - f(x)}{h}}$$



$$\frac{16(2+h)^2 - 16(2)^2}{h}$$

$$\frac{16(4+4h+h^2) - 64}{h}$$

$$\frac{\cancel{64} + 64h + 16h^2 - \cancel{64}}{h}$$

at 2 sec. $= 64 + 16h$

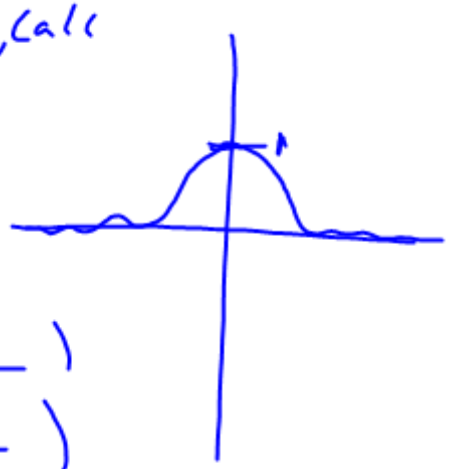
$$\lim_{h \to 0} = \frac{f(x+h) - f(x)}{h}$$

limits → approaching a certain value

$$\lim_{h \to 0} 64 + 16h = 64$$

find

(a) $\lim_{x \to 0} \frac{\sin x}{x} = 1$ $\quad \frac{\sin(1 \times 10^{-99})}{1 \times 10^{-99}} = 1$



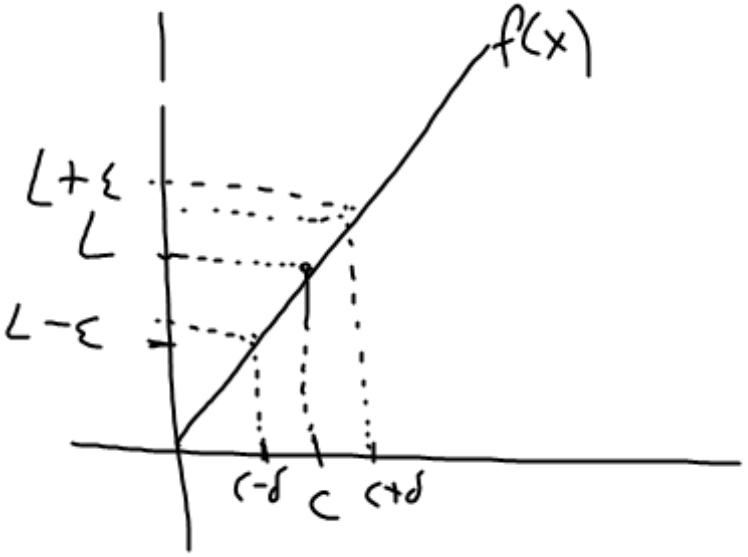
$m \to (-0.001, \_\_)$

$(0.001, \_\_)$

(b) $\lim_{x \to 2} \frac{x^3 - 1}{x - 2}$ = depends on which side you go from

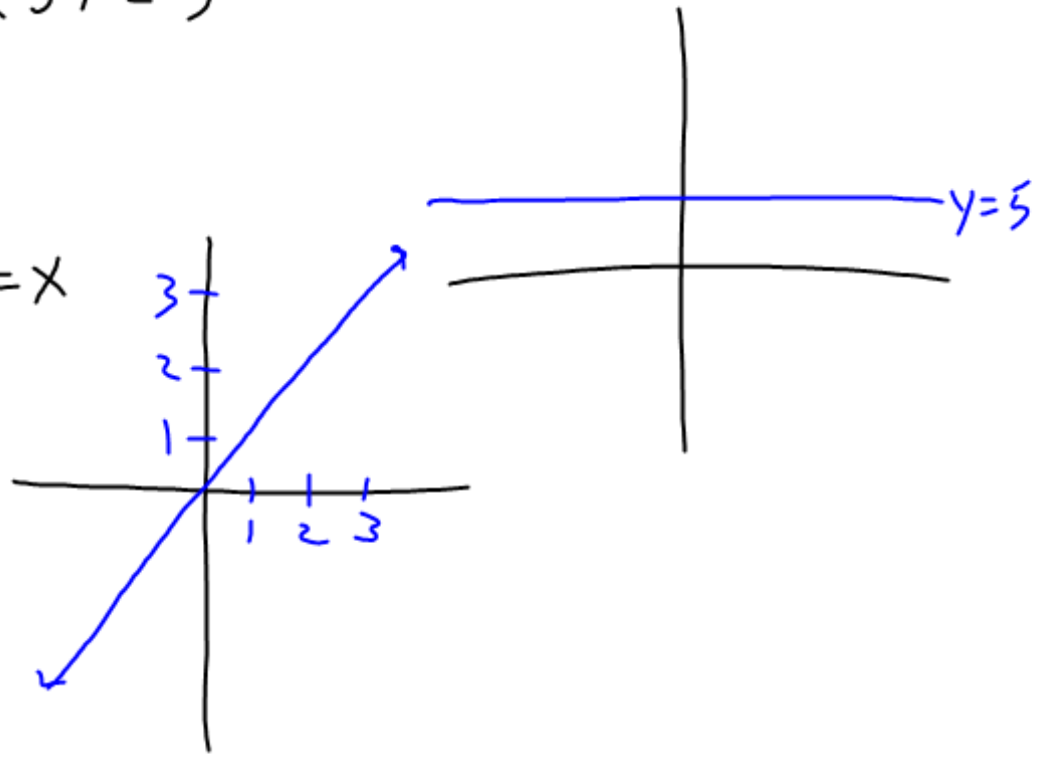
$$0 < |x - c| < \delta \Rightarrow |f(x) - L| < \varepsilon$$

$$\lim_{x \to c} f(x) = L, \quad c \text{ & } L \text{ are } \mathbb{R}$$



$\lim_{x \to c}(k) = k$, $\lim_{x \to c}(5) = 5$

$\lim_{x \to c}(x) = c$, $f(x) = x$



$$\lim_{x \to c} \big(f(x) + g(x) \big) = L + M$$

$f(x) \to L$, $g(x) \to M$

$f(x) = 5$

$g(x) = x$

$$\lim_{x \to 7} \big(f(x) + g(x) \big) = 5 + 7 = 12$$

$f(x) \to 5$, $g(x) \to 7$

Read 2.1, all of it

QR. #1, 3

p.s. #1, 3, 5, 7, 15, 16, 19, 23-29(odd), 35-37, 39-44(1), 49